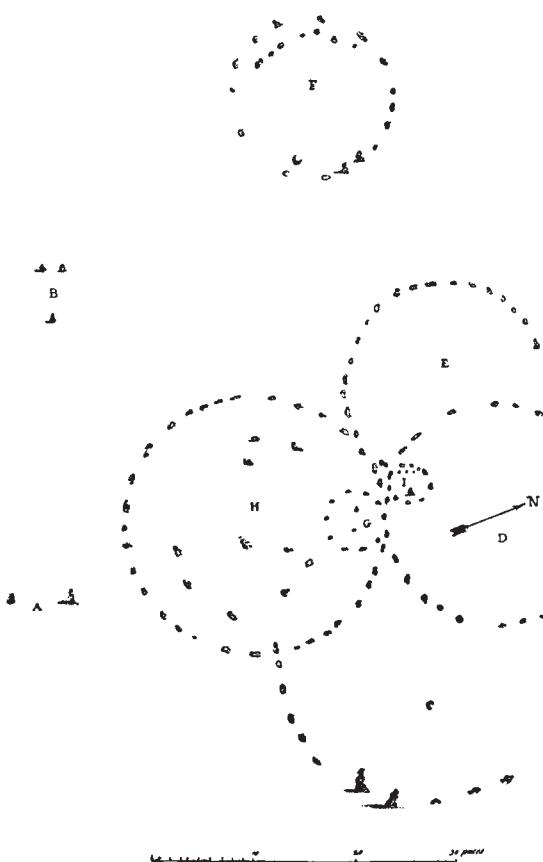


## THE BOTALLEK CIRCLES.

BORLASE, in his "Antiquities of Cornwall" (p. 199), published in 1769, refers to what he terms "the curious cluster" of circles at Botallek,

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Botallek Circles in S. Just



To the Rev. Jeremiah Milles D.D. Precentor of the Church of Exeter  
This plan is with great respect inscribed by Wm. Borlase.

FIG. 1.

the seeming confusion of which led him to write "I cannot but think that there was some mystical meaning, or, at least, distinct allotments to particular uses."

Fortunately for science, he accompanies his account with a plan, evidently carefully prepared (Fig. 1), which is now the only thing that remains; every stone has been utilised in building an engine house, or in other ways. Only the site is shown on the ordnance map.

As the "cluster" of circles exceeds in elaboration anything of the kind with which I am acquainted, it was of great interest to see if anything could be made of it in the light of other researches in Cornwall, and I propose now to state the result in a very abridged form. Fuller details I have communicated to the Royal Society.<sup>1</sup> The first point of inquiry concerned the N. point given on the plan—whether it was true or magnetic. A perusal of Borlase's volume showed that he was fully acquainted with the necessity of referring in such descriptions to the true north, instead of, as he says, "such an inconstant and fluctuating index as the declination of the needle, which is not

only different in different places, but varies also at different times in one and the same place" (p. 115).

When this point was settled, it became evident at once, when the circles were completed and lines drawn from centre to centre, that approximately the same azimuths were in question as those met with in other Cornish circles.

Borlase does not give the heights of hills. I therefore asked Mr. Thomas, an active member of the Cornish Society for the Astronomical Study of Ancient Monuments, to observe them for me.

Among the azimuths were two, the first from the approximate centre of the circle F to the approximate centre of E, N.  $83^\circ$  E., and the second, from the approximate centre of F to that of H, S.  $66^\circ$  E. In sending his results to me Mr. Thomas remarked that the former line passes over the Carn Bean barrow and the latter passes  $24^\circ$  to the N. of the Goon Rith barrow; thus the azimuth of the Goon Rith barrow would be S.  $63\frac{3}{4}^\circ$  E. This enabled me to check the accuracy of Borlase's N. point.

The two alignments to two still existing barrows are common to Botallek and other monuments in Cornwall. On the assumption of identity of object, Borlase's orientation was true, and not magnetic, and, also, was not far from the mark.

The next step was to make a very careful determination of the centres of the circles, and it was found that the line, centre of F to centre of H, coincided with the line S.  $63^\circ 45'$  E. from the former to the Goon Rith barrow. In other words, the difference between the azimuth we had provisionally determined from the circles and that of Goon Rith barrow was due to an error of centring, and no doubt was left that the line between the centres of F and H was really directed to the barrow. Similarly the line N.  $83^\circ$  E. joining the centres of F and E was directed to the Carn Bean barrow. Both these lines were recognised as familiar, giving, approximately, the November sunrise and the heliacal rising of the Pleiades in May respectively. In the case of the S.E. azimuth there is an alternative explanation of the sight-line. Both in Cornwall and Wales we have found that azimuth-marks (barrows, &c.) were sometimes erected so that they gave the direction of sunrise a fortnight or three weeks before the critical date. I therefore decided to adopt the

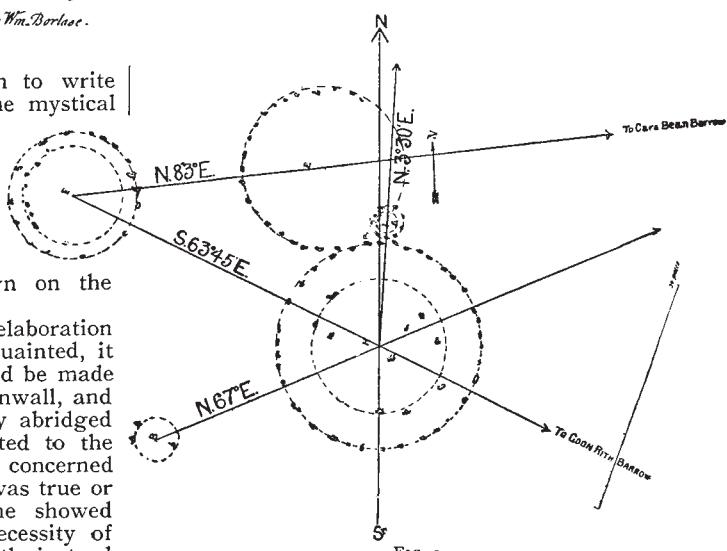


FIG. 2.

Pleiades azimuth, N.  $83^\circ$  E., as the fundamental line by which to fix the N. point, and it followed

<sup>1</sup> Proc. Roy. Soc., March, 1909.

that Borlase's N. point was less than  $3^{\circ}$  to the west.

Working on this basis, I joined up the centres of the circles, as shown on the plans (Figs. 2 and 3), and carefully measured the resulting azimuths. These I sent to Mr. Thomas, asking him if the slight modifications of azimuths that I had introduced had sensibly altered his values for the corresponding angular elevations. After a second series of observations, he replied that the elevations were the same for the modified azimuths as they were before.

It at once became obvious that the alignments divided themselves into two groups—one erected for the observations of the May-year, the other for solstitial phenomena—and with each group there is associated a clock-star which affords a means of determining the approximate date of each group. For this reason I give two separate plans (Figs. 2 and 3) showing the separate groups of alignments, and two separate tables giving the respective results. I will deal with the May-year circles first, table I. (Fig. 2).

These results agree with the May-year results previously obtained from the study of other Cornish circles, and to illustrate this I bring together a selection of the results previously published (table II.).

An examination of Fig. 2 shows that the azimuths given in the table are exactly those obtained by joining up the centres of the circles and adopting the N.—S. line derived from Mr. Thomas's two measures of direction. The results justify the  $3^{\circ}$  change of the orientation of Borlase's plan.

*The Solstitial Year.*  
Joining up the centres of H, G, D, and C, as shown in Fig. 3, we obtain the results given in table III.,

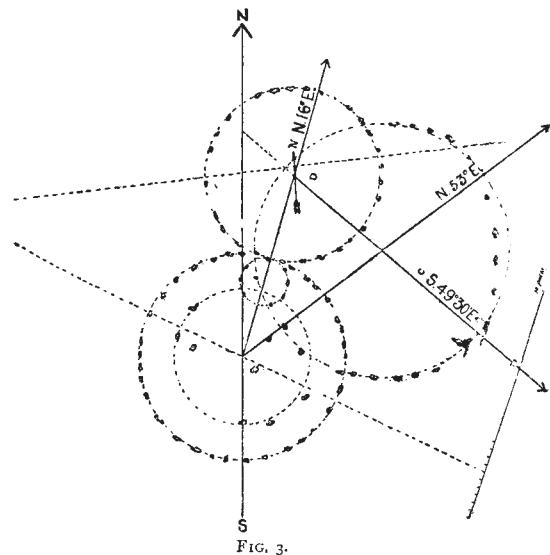


FIG. 3.

results which are obviously connected *inter se* and with the solstitial year.

I.—May-year Alignments at Botallack (lat.  $50^{\circ} 8' N.$ ).

Alignment	Azimuth	Hill (Mr. Thomas's) measures	Declination	Object	Date
Centre of circle B to centre of circle H	N. $67^{\circ} 0' E.$	$3^{\circ} 0'$	$16^{\circ} 31' N.$	May sun	May 6; Aug. 7
Centre of circle F to centre of circle H to Goon Rith barrow	S. $63^{\circ} 45' E.$	$2^{\circ} 44'$	$14^{\circ} 43' S.$	November sun (possibly a warner)	Nov. 2; Feb. 10
Centre of circle F to centre of circle E to Carn Bean barrow	N. $83^{\circ} 0' E.$	$3^{\circ} 35'$	$7^{\circ} 2' N.$	Pleiades (warning May sun)	1680 B.C.
Centre of circle H to centre of circle I	N. $3^{\circ} 30' E.$	$0^{\circ} 0'$	$39^{\circ} 14' N.$	Arcturus (clock-star)	1730 B.C.

II.—Similar May-year Alignments in Cornwall (for comparison).

Monument	Lat. N.	Alignment	Azimuth	Hill	Declination	Object	Date
Merry Maidens...	$50^{\circ} 4'$	Circle to Fougou ... ...	N. $64^{\circ} 0' E.$	$0^{\circ} 30'$	$16^{\circ} 21' N.$	May sun	May 5; Aug. 7
Boscawen-Un ...	$50^{\circ} 5'$	stone ... ...	S. $66^{\circ} 30' E.$	$1^{\circ} 0'$	$14^{\circ} 32' S.$	Nov. sun	Nov. 2; Feb. 10
The Hurlers ...	$50^{\circ} 31'$	S. circle to N.E. stone ...	N. $78^{\circ} 47' E.$	$0^{\circ} 12'$	$7^{\circ} 23' N.$	Pleiades	1610 B.C.
Trippet stones ...	$50^{\circ} 33'$	Centre of circle to Rough Tor	N. $15^{\circ} 0' E.$	$1^{\circ} 30'$	$39^{\circ} 1' N.$	Arcturus	1700 B.C.

III.—Solstitial Alignments at Botallack (lat.  $50^{\circ} 8' N.$ ).

Alignment	Azimuth	Hill (Mr. Thomas's) measures	Declination	Object	Date
Centre of circle H to centre of circle C	N. $53^{\circ} 0' E.$	$1^{\circ} 45'$	$23^{\circ} 41' N.$	Solstitial sun (summer)	
Centre of circle D to centre of circle C	S. $49^{\circ} 30' E.$	$1^{\circ} 35'$	$23^{\circ} 44' S.$	Solstitial sun (winter)	
Cent. of circ. H to cent. of small circ. G	N. $16^{\circ} 0' E.$	$0^{\circ} 0'$	$37^{\circ} 28' N.$	Arcturus (clock-star)	1420 B.C.

IV.—Similar Solstitial Alignments in Cornwall (for comparison).

Monument	Lat. N.	Alignment	Azimuth	Hill	Declination	Object	Date
Boscawen-Un ...	$50^{\circ} 5'$	Circle to Fine Menhir ...	N. $53^{\circ} 30' E.$	$2^{\circ} 23'$	$23^{\circ} 59' N.$	Solstitial sun (summer)	
The Hurlers ...	$50^{\circ} 31'$	N. circle to S.E. stone ...	S. $50^{\circ} 50' E.$	$1^{\circ} 18'$	$24^{\circ} 17' S.$	Solstitial sun (winter)	
Tregeseal ... ...	$50^{\circ} 9'$	Longstone to Chûn Castle...	N. $23^{\circ} 30' E.$	$1^{\circ} 35'$	$37^{\circ} 9' N.$	Arcturus	1350 B.C.

As before, I give a selection from previous results, showing that the alignments we are now dealing with have become familiar by reason of their occurrence at the Cornish monuments investigated earlier (table IV.).

From the results given above it is evident that in this "curious cluster" of circles at Botallack we have an epitome of the chief sight-lines used in Cornwall. May-year sun, clock-star, warning-star, and solstitial sun are all represented.

The May-year group was the first, by something like 300 years, to be erected, and it should be noted that the date for the Pleiades circle E is coincident, within our probable error, with the date of the clock-star alignment H—I.

Borlase's plan (Fig. 1) affords us evidence on this point, for it shows that the circles F, H, and I are associated by being made up of two concentric rings of stones.

NORMAN LOCKYER.

#### WESTERN TEACHING FOR CHINA.

THE meeting which was held in the Mansion House last week, and presided over by the Lord Mayor, shows that at last an interest is being taken in this country in the education of China in Western science and literature. Further proofs of the same interest are given by the movement promoted by Sir Frederick Lugard, the Governor of Hong Kong, for the foundation of a university in that colony, and of another by the German authorities in the province of Shantung. The larger question of Chinese university education, already undertaken by the Chinese authorities, is at present under the consideration of a joint committee of members of the universities of Oxford and Cambridge, so that it looks as if the Chinese are not likely to want for advice and assistance in carrying out the educational development of their country.

The four schemes which have been mentioned in no way conflict with each other, and if there are sufficient means there are no reasons why they should not all be carried out. Their success and usefulness will depend, in great part, on the spirit which animates the work which they do. The interests of China must always be the chief object in view. If the proposed university at Hong Kong be looked upon simply as a means of advancing British interests, and that at Shantung of advancing German interests, they may at first have a certain amount of success, but they would be doomed to failure before long, as nothing touches the spirit of Eastern people so much as any attempt to thwart their legitimate national aspirations. The success of the Japanese has been in great part due to the fact that while they have taken advantage of Western assistance, all their institutions have been moulded according to Japanese ideas, and with the object of enabling Japan to take her due place among the nations of the world. Other causes have been added as things developed, but this has been the fundamental one. No attempt must be made to mould the Chinese into Eastern Britons or Germans.

The medical colleges proposed by the China Emergency Committee are very much needed, as was fully shown at the Mansion House meeting by the present writer's fellow-student of forty years ago, Dr. J. Campbell Gibson, of Swatow, who was supported by Dr. J. B. Paton, of Nottingham. They pointed out

"that the importance of the steps suggested was not measured by the possibilities of the four colleges which were proposed, for the time will come—let us hope speedily

—when the Chinese Government must itself take up medical education; and the presence, as models, of institutions on Western lines will then be decisive as to the scientific principles on which the State action must proceed. The cry in China of 'China for the Chinese' will thus be satisfied in the best possible way."

The proposed university at Hong Kong is intended—at least, to begin with—chiefly to train medical men and engineers. Already useful work in the way of training medical men has been done by the Hong Kong Medical College, founded in 1887, and a beginning has been made in technical education in the so-called "Technical Institute," which gives opportunities for instruction in various subjects, but especially engineering and its allied subjects. The proposed university would therefore be a development of existing institutions, and there can be no doubt that Hong Kong would offer many facilities for the practical sides of the studies. Sir Frederick Lugard has pointed out that

"Its dockyards and electrical and other works will afford practical instruction which can hardly be rivalled in China for very many years; while the location of the university in a British colony will, on the one hand, form an attraction to students who desire to obtain opportunities for colloquial English and to acquire something of the Western atmosphere as well as the mere dry bones of knowledge, and, on the other hand, to professors who might less willingly accept an exile in China. In the medical faculty more especially, Hong Kong can offer facilities for practical anatomy in the dissecting-room which Chinese prejudice, at present at any rate, precludes in China."

Of course, other subjects and degrees would be added as circumstances permit, notably an arts degree. The preparation for that, however, should not proceed strictly on the lines of British colleges, but should comprise international law and treaties, geography, comparative history, and, not least, Chinese literature and classics, so that there may be no reproach of dissociating Chinese students from their national sympathies and language.

The colony of Hong Kong will soon be connected with the main railway system of China, so that the university would appeal to a very large area, as the Chinese will not be slow to recognise that here are to be obtained the advantages of Western education at a smaller cost, and under more desirable conditions in various ways, than by sending their sons to the West. More than thirty years ago, when I was in Japan, as principal of the Imperial College of Engineering, Tokyo, I very often discussed projects of this kind with the first Chinese Minister to Japan, and when I suggested a duplicate of our college in China, he said that "the streets of Peking were too narrow for such an institution." This, of course, was simply his way of saying that he did not think China was yet ripe for a fully developed scheme of technical education.

Much has happened since then, and the students of the Imperial College of Engineering have been important factors in the making of New Japan, a fact which has been recognised by the Chinese, and now there are large numbers of Chinese students in Japan and considerable numbers in Europe and America. In Glasgow, for instance, they are almost as numerous as the Japanese students, but, of course, there is not the same necessity for the latter coming here as formerly, as they have such good facilities for study in their own country.

My Chinese friend was a philosopher in his way, and was not unacquainted with the very difficult poli-